[0024] FIG. **13**C is a side view of an electrical probe according to an embodiment of the invention;

[0025] FIG. **14** is a perspective view of an audio plug connector according to an embodiment of the invention;

[0026] FIG. **15** is a perspective view of an audio plug connector according to an embodiment of the invention;

[0027] FIG. **16** is an exploded perspective view of an audio receptacle connector according to an embodiment of the invention;

[0028] FIG. **17** is a cross-sectional view of an audio connector installed in a housing having a self-healing elastomer barrier layer according to an embodiment of the invention;

[0029] FIG. **18** is a cross-sectional view of an audio connector installed in a housing having a self-healing elastomer barrier layer with conductively doped regions over the connector contacts according to an embodiment of the invention;

[0030] FIG. **19** is a cross-sectional view of an audio connector installed in a housing having a self-healing elastomer barrier layer with conductively doped regions over the connector contacts according to an embodiment of the invention; and

[0031] FIG. **20** is a method for mating a data or audio connector with an external connector on an electronic device having a self-healing layer.

DETAILED DESCRIPTION

[0032] Certain embodiments of the present invention relate to electronic devices. While the present invention can be useful for a wide variety of electronic devices, some embodiments of the invention are particularly useful for electronic devices that have a layer of self-healing elastomer disposed over one or more external electronic connectors, as described in more detail below.

[0033] FIG. **1** depicts a simplified diagram of an example electronic device **100** that may incorporate an embodiment. Device **100** is used for illustration only; the concepts/techniques of the invention can be employed in myriad electronic devices. For example, it is understood that embodiments of the invention are not limited to smartphones and may be employed in any type of electronic device including, but not limited to, wrist watches, portable media players, notebook computers, docking stations, desktop computers, portable radios, televisions, and set top boxes.

[0034] In the embodiment depicted in FIG. **1**, electronic device **100** includes a front face **105** having a display screen **110**, a sensor **115**, a speaker **120**, a home button **125**, an audio connector **130** and a microphone **131**. In some embodiments sensor **115** may be a camera, an infra-red detector or an ultrasonic detector. Although the embodiment in FIG. **1** shows only one display screen, sensor, speaker, home button, audio connector and microphone, it is understood that myriad configurations and quantities of these features are possible without departing from the invention. Electronic device **100** also includes on/off switch **132** and volume buttons **133***a*, **133***b*.

[0035] FIG. **2** depicts a simplified diagram of the rear of electronic device **100**. Electronic device **100** includes housing **150** configured to be a rectangular prism having a back face **135** positioned opposite front face **105**. In other embodiments, housing **150** may be shaped differently, for example in one embodiment the housing is curved and shaped to be worn on a user's wrist. Electronic circuitry **134** is disposed within housing **150** and is coupled to display screen **110**, sensor **115**, speaker **120**, home button **125**, audio connector **130**, microphone **131**, on/off switch **132** and volume buttons **133***a*, **133***b*. FIG. **2** also depicts an audio plug connector **145** that is matable with audio connector **130**, and data plug connector **155** that is matable with data connector **140**. In certain embodiments, one or more of connectors **130**, **140** may employ an embodiment of the invention. Embodiments of the invention may be used on a variety of different electrical connectors.

[0036] FIG. **3** depicts a simplified close up plan view of data connector **140** and a portion of housing **150** (see FIG. **2**), and FIG. **4** illustrates a simplified cross-section (see section A-A in FIG. **3**) through one of plurality of contacts **310**. Housing **150** has an opening **305**. Data connector **140** is operatively coupled to electronic circuitry **134** (see FIG. **2**) within housing **150**. Data connector **140** includes plurality of contacts **310** disposed on a substrate **410** and accessible through opening **305**. Although plurality contacts **310** are illustrated as four circular pads arranged in a linear pattern, the plurality of contacts may be of any number, any shape and any pattern. Further, in some embodiments, plurality of contacts **310** may not be pads, but may be other electrical contacts, such as, but not limited to blade-type connectors, sliding-type connectors or cylindrical-type pin and socket connectors. Substrate **410** may be a part of electronic circuitry **134** (see FIG. **2**) disposed within housing **150**.

[0037] Unlike in a typical electrical connector in which the contacts are exposed for an electrical connection to a corresponding connector, contacts **310** are buried beneath a layer of self-healing elastomer **315** which covers opening **305** and plurality of contacts **310**. Elastomer **315** thus provides a strong environmental seal that protects contacts **310** from the environment including dust, debris, moisture and gas and prevents the contacts from being accessed without a tool or corresponding connector that can penetrate self-healing elastomer **315**. In some embodiments, self-healing elastomer **315** may be filled with a pigment and blended with housing **150** such that it may appear contiguous with the housing and be substantially imperceptible thus hiding the connector such that a user may not even realize the electronic device even has an external connector.

[0038] In some embodiments self-healing elastomer **315** extends over housing **150**, beyond opening **305**. In other embodiments self-healing elastomer **315** may be disposed only within opening **305** and may not extend over housing **150**. The size and thickness of self-healing elastomer **315** may depend on the size of opening **305**, which in turn is dependent on the size and shape of connector **140** and the thickness of housing **150**. In some embodiments where it is desirable for electronic device **100** to be thin, self-healing elastomer **315** may be less than 0.5 mm thick. In other embodiments self-healing elastomer **315** may be between 0.5 mm to 0.1 mm thick. In further embodiments self-healing elastomer **315** may be between 0.1 mm to 0.2 mm thick. In yet further embodiments self-healing elastomer **315** may be greater than 0.2 mm thick. In other embodiments the thickness of self-healing elastomer **315** may be greater than 0.5 mm.

[0039] Self-healing elastomer **315** may be a polymer with elastic properties such as a low Young's modulus and a high failure strain. In further embodiments, self-healing elastomer **315** may comprise a silicone material, also known as a polymerized siloxane. In some embodiments, the polymerized siloxane may be mixed inorganic-organic polymers with the chemical formula [R2SiO]n, where R is an organic group such as methyl, ethyl, or phenyl. In these embodiments the